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Integrating Sangiran Purba's Human Site Museum to Project-Based Learning in Science Course: The-Earth Materials

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ABSTRACT

The purpose of this study is to explain the benefits of integrating Sangiran Purba's Human Site Museum and Project-based Learning in The-Earth Material in Science. Twenty-eight seventh grade Junior High School students in Karanganyar, Central Java follow this course in the second semester in the academic year of 2016/2017. The students work in teams to do the project based on their observation and analysis on the phenomena in Sangiran. The researchers use a mixed method research approach to analyze this research by using questionnaire and interview to obtain data on students' responses to the course. The conclusions of our study are: 1) this course is successful in developing of research skills, teamwork and group discussions; 2) students are not accustomed to learn independently and to learn by using scientific approach; 3) students faces difficulties in making project report and in doing presentation. 4) Project-based-learning can be used as a media to help the students to know about local wisdom in their motherland.

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1. INTRODUCTION

In this article, we describe a Science course that involved Sangiran Purba's Human Site and it was followed a project-based learning model. In this course, the material is based on 2013 Teacher Book for seventh grade Junior High School in 3.10 Basic Competencies (Kompetensi Dasar 3.10). In KD 3.10, students have to know and understand about: how the earth forms, the layer of inside the earth, volcano and its eruption products, atmosphere layers, and water-cycle. There is a relationship between 3.10 Basic Competencies and Sangiran Purba's Human Site. Sangiran is a tangible unique place which shows seabed layer located in the middle of the Java Island. The students can compile their own knowledge based on the phenomenon easily. The course took place at the Junior High School, SMP 1 Karanganyar, Central Java, Indonesia, during the second semester in the academic year of 2016/ 2017. The course had five-hour meeting in a week. The course objective was to teach the 28 seventh grade Junior High School students to study The-Earth Materials. The course was held in a happy classroom; sometimes, we learned outdoor and sometimes, we learned indoor. Each student had a laptop with internet connection.

The researchers decided to conduct the course followed by a project based learning model (PjBL). We challenged the students in team to analysis The-Earth Materials in Sangiran, and then to create project (miniature, poster, or image) to describe the materials. In order to measure students' response to the course, the researchers applied a mix method research using questionnaire and group interviews. The researchers chooses Project Based Learning (PjBL) because it enables students to solve problems [1] and students' can become active in investigating and in making decision by improving their thinking skills [2, 3].

Frank & Barzila [4]state that Project Based Learning is one of the constructivists teaching and learning models of teaching that is implemented to make students familiar with science education. PJBL does not have a rigid lesson plan [5] so that students determine their own path for learning objectives spectacularly. In order to provide students with a meaningful experience, we decide to design a course where the students would learn science differently. Students would be given challenge to do the research on real-world problems with clear research questions that would gain the students in a place, analyze the cause of the problems, reach conclusions, and write a project about the experience. But how could we do so in a real practice?.

The researchers decided to connect science learning with Sangiran, an Purba's Human Site museum in Java Island, Indonesia. We choose Sangiran because there is a unique case in fossils discovery history. We considered that this kind of research would raise the students' interest in the course and research so that it would help them to develop thinking skills and comprehend The-Earth Materials.

To plan the groundwork, before the course began, the researchers contacted Sangiran official and the official gave an approval to visit there. In the first class, we explained the course purpose and we told the students that we were going to follow a project-based learning and explained its basic concepts. We also told them that they would work in team of seven to do the research and create a project. We explained that we had created pre-defined research questions related to Sangiran museum. Each team chose corresponding research question in Table 1. Students had to obey some rules while doing the research. First, students had to define the borders of the study clearly. Second, each group member had to take responsibility in studying. Third, the duration of the study should be determined.

Table 1. The research objectives and the phenomena displayed in Sangiran Museum

Research Objectives	Sangiran
Define the main parts of Earth Structure	The phenomenon of "fish fossil" found in Sangiran which is far from beaches and the soil condition in Sangiran which is similar to those found in the sea ground
The geosphere (volcano erupt or earthquakes)	Soil layers in Sangiran have the same characteristics in its different points and it has the characteristic of a soil layer in dome.
Describe the composition and characteristics of the atmosphere	Atmosphere layers of Sangiran is described following the-earth atmosphere
The hydrosphere and water cycle	The river streams found in the site where fossils are found and the history of sea in Sangiran salt water spring

Project based learning (PJBL) is a development teaching and learning introduced by John Dewey. According to Bell [6], PJBL is an innovative approach to learning that teach multi strategies for success in 21st century. Ergül & Kargın [7] said that PJBL is one of student-centered learning methods that gives students the opportunity to take part in the learning environment, makes students take the responsibility of their own learning, develops students' skills, and helps students to comprehend and structure the information. Thomas [8] said that in PJBL, projects are the central not the peripheral aspect to the curriculum. It means that in PJBL, the project is the center of teaching strategy; students get experiences and learn the concepts of the discipline via the project.

We challenged the students to do their research on Sangiran because Sangiran is very significant geological sequence from the upper Pliocene until the end of Middle Pleistocene that describes human, faunal, and cultural evolutions within the last 2.4 Million years. Sangiran is an archaeological site in Java. It is located at 7o 25'- 7o 30' South Latitude and 4o-7o 05' East Longitude. Based on Wikipedia, Sangiran has a dome which was created millions of years ago through tectonic uplifts. The dome was then scrapped spreading beds within the dome which are rich in archeological records. Top of the dome is then opened because of erosion to form depression. In the depression, the archeologists found fossils in soil layers that informed life in the past.

Sangiran has five Cluster to display fossils, there are Krikilan cluster, Dayu cluster, Ngebung cluster, Bukuran cluster and Manyarejo cluster. In Krikilan cluster, there are three display areas. Display area 1 shows the Wealth of Sangiran, display area 2 tells about Steps of Humanity, and display area 3 shows about the Golden Era of Homo Erectus – 500.000 Years Ago. In Dayu Cluster, there is a real example of soil layers from various eras starting from Pucangan formation (lower Plestosen1, 8 million-900 thousand years ago) until Notopuro formation (Upper Plestosen 250 - 100 thousand years ago). In Ngebung, Bukuran and Manyarejo cluster; there is ancient human diorama, giant elephant fossil, outer space room, and the site of where fossils are discovered. From the description above, our research question is: what is the benefit of integrating Sangiran Purba's Human Site Museum and Project based Learning in The-Earth Material in Science.

2. RESEARCH METHOD

The course was designed to follow a project-based learning model. To assure that students know what they are doing, each group has a guide to explain information about the activities of the projects in Table 1 and in Figure 1.

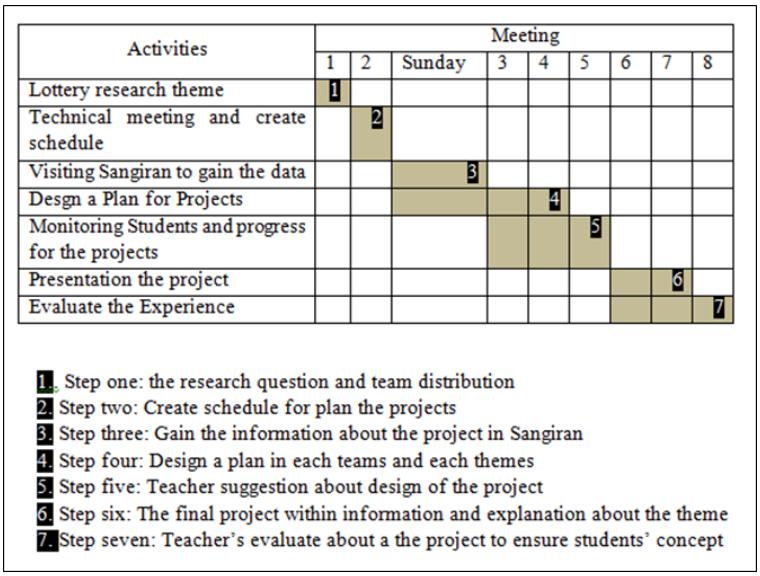

Figure 1. The planned activities in learning process

In the first meeting, we asked the students to let us know about the purposes of learning and lesson plan about the project-based learning. In the second meeting, students then chose the research theme which is compiled based on Kompetensi Dasar (KD) 3.10 and came together with their teams. Students in their team then created the schedule to plan the project. The researchers talked to them about teamwork and collaboration. The researchers showed them how to create schedule in project by dividing the teams into two scopes, product and project report. We gave them 'team assessment form' to rate their member based on their contribution.

In Sunday after the second meeting, Students visited Sangiran to gain the information about their project in Sangiran. Every team had one guide to describe all about Sangiran and they could ask any question to the guide. Students were also suggested to take the pictures needed to complete their data.

In the third meeting, students were asked to design a plan for their project and teacher monitored the students to give suggestion. Students also made proposal about their project. The proposal contains: 1) purposes of the project; 2) literature review; 3) description and sketch of the project; 4) tools and substance for making project; and 5) the cost. Then, if teacher gave an approval for the students' project, students began to do the project.

In the fourth meeting, students began to build the project based on their team discussion. The teacher monitored the students' work and gave suggestions. Students had many questions in this meeting. We discussed the material of their projects to increase their knowledge.

In the fifth meeting, students had to finishing their project. The report should be submitted after the presentation was done. We reviewed again their project and report to ensure that the students had true concept. In this meeting, we discussed with students about how to make good presentation and power point presentation to convince audiences. Students were given a piece of paper each used to score the presenters' performance and were given another piece of paper to take important points.

In the sixth and seventh meeting, the students presented the product of their project. The students who did not do the presentation should score their classmates' performance and taking notes on the important points on the piece of paper given in the previous day. Other students also uttered questions and gave suggestion to the presenters while the teacher gave feedback. After doing the presentation, the students wrote the questions and the teacher's feedback in report to revise the project.

In the eight meeting, the students submitted the project report and did the task to evaluate their experiences. The task consisted of 25 multiple choice questions from 5 indicators in Kompetensi Dasar (KD) 3.10 about The-Earth Material. The task divided into 4 categories based on Bloom's taxonomy (Remember,

Understand, Apply, and Analyse). The aim of this evaluation was to know the effectiveness of project-based learning to improve the students' knowledge.

2.1 Research Design

The researchers followed a mixed method research approach to analyze this research using questionnaire and group interview to obtain data on students' responses to the course. The researchers designed a questionnaire by means of closed-ended questions to collect quantitative data and open-ended questions to collect qualitative data.

2.2 Participants

The population of this study is 260 seventh grade Junior High School students SMP N 1 Karanganyar which is divided into 9 classes. Specifically, cluster random sampling method was used to choose the sample. We choose random sampling because the populations have the same science skill (homogeneous and normal distribution) viewed from the results of the middle semester test. There were 28 seventh grade Junior High School students in second semester, age from 13-14. Twelve students are men and sixteen students are women as a sample.

2.3 Research Instrument

The research instruments were the questionnaire and field notes to interview the students in group. We didn't use observation instruments because the students in an awkward predicament when teacher observe them. An atmosphere of the discussion didn't being natural when the observer comes close to students. The questionnaire had four close ended questions (Appendix One) and seven open-ended questions (Appendix Two). We designed two close-ended questions in order to know the students' experiences in learning by using project-based learning and to know students' experiences in Sangiran. We also designed two close-ended questions in order to know if the project facilitated the learning and if the students' involvement with a real problem in Sangiran Museum also contributed their learning.

We designed the open-ended questions in order to know the difficulties and the advantages of the project based learning to teach students. The researchers wanted to know the students' opinion about the project-based learning processes starting from visiting Sangiran, designing a plan, creating schedule, creating project, creating report, and doing presentation.

2.4 Procedure of the Research

As described previously, the questionnaire was given after students finished project based learning. In the group activity, the team was interviewed and team members took field notes. The purpose of interviews was to clarify issues raised by students' questionnaire responses. The students told us about what things that motivated and demotivated them to work. We asked about their teamwork and their problem in teamwork.

3. RESULTS AND ANALYSIS

We analyzed the quantitative data by calculating the percentage in close-ended questionnaire and qualitative data by describing data in open-ended questionnaire and group interview.

3.1 Finding from the questionnaire

Based on the answers of close-ended questions, it showed that twenty four students never did the project based learning before. Four students once had ever done the project-based learning, twelve students had visited Sangiran, and sixteen students have never visited Sangiran. One student who had ever visited Sangiran knows about the history of Sangiran while sixteen students who had never visited Sangiran do not know about it.

In addition, it is revealed that twenty one students agreed with statement "Project facilitated my learning", three were neutral, three partially disagreed, and one totally disagreed. Regarding the statement "having a real problem in Sangiran facilitates students to make project and to understand the concept"; eighteen students totally agreed, six partially agreed, two was neutral, and two was partially disagreed. Students' answers to open-ended questionnaire are divided into four topics.

Topic 1: Students' experience in project-based learning.

The students told that working with project is an enjoyable experience. Students have high motivation to do this project. Students feel that project based learning is more fun than regular class. Students have high enthusiasm in learning. Students can discuss all The-Earth material with their friends in team, so they can ask their team members if they have difficulty in understanding the material.

But, students also face difficulties in working with project. Students have to work hard to finish the project. The students feel if difficult to make the project report and to do the project presentation. Some of the

students are not brave enough to do the presentation clearly. The students feel that project-based learning makes them to learn independently. In the regular class, students only listen to the teacher's explanation. However, in project-based learning, students should actively find the information themselves.

This finding is suitable with the finding of Ming Hung, Jen Hwang, & Iwen Huang [9] that project-based learning is being an innovative approach that improves the learning motivation and attitude. Other researchers [10] also find out that the difficulties in doing project-based learning happen when the students work in groups and create the article (the project).

Topic 2: Students' teamwork and their contribution in team.

The students reported that work in groups is pleasurable. They learn to solve the problems and to respect various point of views. In spite of pleasurable experience, the students state that they have problems in teamwork. Some members have no contribution. In addition, the students admit that their members submit the task given late. Therefore, the task cannot be finished on time.

Topic 3: The connection of Sangiran Museum in students' project learning.

Most students prefer that studying in Sangiran is better than in the class. Students feel that studying to make project in Sangiran makes the learning process fun. Students feel that this course has positive impacts to develop their skills. In addition, Sangiran gives relevant information to The-Earth Material. Students can find fish bone fossils, different soil layers, sea salt spring water which is far from the sea, and so on to give evidences in The-Earth phenomena.

This finding is suitable with the finding of Prince & Felder [11] that project based learning is one of cooperative learning. It works as well as it does because students do not only listen and watch the teacher's explanation but students also learn more by doing some activities. Sastrika, Sadia, & Muderawan [12] state that we can learn better through our active involvement in learning since we reflect what we learn and implement it in real contexts.

Topic 4: The benefit and the lack of project-based learning.

Based on students' opinion, they say that project-based learning have positive and negative impacts. The negative impacts are: students feel that their over-studying in doing the project. Students feel that the time is too short, so researchers have to prolong the duration. Besides, the students are not accustomed to learn independently. In project-based learning, students have to find the solution to the essential question; this makes them over-thinking.

In spite of the negative impacts, students recognize that the positive impacts of learning with project are: They like and enjoy the experience of creating project and visiting Sangiran. They feel that this course develops their research skills. They get new experience in learning and understand new concept easier. This experience is suitable to be used as a basis to develop human resources in the 21st century.

This finding is suitable with Andrew's [13], integrating project-based learning with other places (organization, local wisdom, museum, and others) become a central points in developing a project into more productive learning.

3.2. Findings from group interview

Based on the group interview, researchers summarize that the benefits and the lacks of working in groups in project-based learning integrating with Sangiran are: The benefits of project-based learning are: 1) enhancing quality of learning, 2) increasing students' motivation, 3) helping students to know about local wisdom in their motherland, 4) increasing teacher's skills to manage the class, 5) developing research skills, 6) developing teamwork and group discussions, and 7) drilling students to solve the problem in real life.

The lacks of project-based learning are: it 1) takes long time to learn and 2) emerges some conflicts among team members. Moreover, 3) students are not accustomed to learn independently, 4) students are not used to scientific approach involving real problem (observing, questioning, doing a research, analyzing, implementing), and 5) viewed from communication skill, only active students who can present the product of project in front of the class well.

3.3 Discussion

In discussion section, the analysis will be divided into two data, qualitative and quantitative data. The quantitative data show that the majority of students (85.7%) never learn through project. From 42.8% students who have ever visited Sangiran, only 3% students know the history of Sangiran. More than that, 75 % students agree that project facilitates their learning. In addition, the majority of students (85.7%) agree that having a real problem in Sangiran facilitates them to make project and understand the concept. Therefore, researchers can consider that project-based learning has positive impacts to develop students' skills and Sangiran is suitable place to relate real problem in The-Earth material.

However, the data also shows the lacks of project-based learning terms of in time management skills, the lack of group discussion skills, and the lack of problem solving skills. Based on the students' age and their class, students do not have sufficient experiences to find the solution of a certain real life problem independently. The lacks of implementing project-based learning to Junior High School students can be avoided if they are trained earlier since as stated by Clerc, Miller, & Cosnefroy [14], students, especially young learners, should be fully involved in activities that need various strategies to solve a problem. By doing so, they will develop problem-solving skill.

In addition, in project-based learning, teacher can train the students to face 21st century challenges. Based on Voronchenko, Klimenki, & Kostina [15], project-based learning helps students to develop communication culture, to become highly skilled and tolerant, and to be ready to live and work in multicultural society.

4. CONCLUSION

Revealing on the students' experiences, researchers can say that integrating Sangiran with project-based learning to explain "essential question" is suitable for learning. Students gain rich educational experiences. Students learn three points at once. They learn to do, learn to be, and learn to live together. Moreover, the students do the project, develop their skills, and learn how to solve problems together.

Researchers feel that although this learning is meaningful and successful, researchers should make some changes. In the next research, researchers have to prolong the time in doing the project. Students should be given project works during a semester. The time schedule should be arranged well. In spite of this, the students be familiarized to "how to works in team to form a project".

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